# DRAFT
# CALTRANS
# TRANSPORTATION CONTROL MEASURE (TCM)
# SUBSTITUTION REPORT

January 23, 2007

SOUTHERN CALIFORNIA

ASSOCIATION of
GOVERNMENTS

## CONTENTS

## INTRODUCTION

The Southern California Association of Governments (SCAG) is the designated Metropolitan Planning Organization (MPO) for six counties in Southern California, Imperial, Los Angeles, Orange, Riverside, San Bernardino, and Ventura. As the MPO, SCAG is required to develop and update the Regional Transportation Plan (RTP) and the Regional Transportation Improvement Program (RTIP). The RTP is a long-range plan that identifies multi-modal regional transportation needs and investments over the next 25 years. The RTIP is a short-range program that implements the long-range plan by identifying federal, state, and local funding sources and amounts for specific transportation projects and project phases.

SCAG adopted the current operating 2004 RTP on April 1, 2004 (resolution #04-451-2), and the current operating 2006 RTIP on July 27, 2006 (resolution #06-477-2). Both the RTP and RTIP were developed in a comprehensive, cooperative, and continuing process that involved a broad spectrum of transportation and related stakeholders, as required under the Transportation Equity Act for the 21st Century (TEA-21).

The California Department of Transportation (Caltrans) has requested that SCAG amend the 2006 RTIP to replace an existing full time High Occupancy Vehicle (HOV) lane with a part time HOV lane (see Attachments A, B). The operational change would last for a period of three years after which time the HOV would revert back to full time.

The purpose of this document is to identify the specific details of the proposed TCM substitution and associated amendment to the 2006 RTIP and to ensure that the proposed changes are consistent with federal and state requirements, including the Clean Air Act (CAA) section 176(c) as revised by the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). All analyses for both the 2004 RTP and 2006 RTIP are incorporated into this document.

## PROJECT DESCRIPTION

Caltrans is proposing to convert an existing full time HOV lane to a part time lane in both directions on an eight mile segment of the SR-60. The proposed segment would begin just east of the SR-60 and Interstate 215 junction and would continue to Redlands Boulevard. The conversion would last for a period of three years at which time it will revert back to a full time HOV lane. As proposed, the HOV lane would be HOV only from 6 AM through 10 AM and from 3 PM through 7 PM and would be open to single occupant vehicles the remaining hours of the day. Signage will be installed to inform motorists of the new hours of operation. No additional changes (striping, ingress/egress, etc.) are proposed.

Riverside County Transportation Commission (RCTC), in conjunction with Caltrans, is providing the following projects to be combined with the part time HOV as the formal substitution package;

- N. Main Corona Parking Structure: 830 space parking structure at the Corona Metrolink Station

- Freeway Service Patrol expansion: add to network of privately owned tow trucks to remove disabled vehicles in congested areas. Two additional vehicles on route 60 from Main to Milliken
- Freeway Service Patrol expansion: add to network of privately owned tow truck to remove disabled vehicles in congested areas. Two vehicles on a new route, I-215, Alessandro to SR-74.
- Park n Ride Lot: 141 spaces in City of Perris.
- Signal Installations: eliminating four way stops in city of Moreno Valley, five individual projects throughout Moreno Valley

Timely Implementation of TCMs

Substitution of the full time SR-60 HOV lane TCM must follow the substitution process specified in the CAA section 176(c) as amended by SAFETEA-LU. The CAA as amended requires that the replacement TCM meet the following criteria:

| | |
|---|---|
| 176(c)(8)(A)(i) | The substitute measure achieves equivalent or greater emissions reductions than the control measure to be replaced; |
| 176(c)(8)(A)(ii) | The substitute control measures are implemented in accordance with a schedule that is consistent with the schedule provided for the control measures in the implementation plan; |
| 176(c)(8)(A)(iii) | The substitute and additional control measures are accompanied with evidence of adequate personnel and funding and authority under state or local law to implement, monitor, and enforce the control measure; |
| 176(c)(8)(A)(iv)(I) | The substitute and additional control measures were developed through a collaborative process that included participation by representatives of all affected jurisdictions (including local air pollution control agencies, the state air pollution control agency and state and local transportation agencies); |
| 176(c)(8)(A)(iv)(II) | The substitute and additional control measures were developed through a collaborative process that included consultation with the Administrator; |
| 176(c)(8)(A)(iv)(III) | The substitute and additional control measures were developed through a collaborative process that included reasonable public notice and opportunity for comments; and |
| 176(c)(8)(A)(v) | The metropolitan planning organization, state air pollution control agency and the Administrator concur with the equivalency of the substitute or additional control measure. |

TCMs are contained in Appendix IV-C of the Air Quality Management Plan/State Implementation Plan (AQMP/SIP). The TCM substitution process followed by SCAG is also spelled out in this appendix to the 1994, 1997 and 2003 AQMPs. The AQMP specifies procedures for replacing individual projects such as the HOV full time to part time replacement. This process includes:

- The CTCs and/or project sponsors shall notify SCAG when a TCM project cannot be delivered or will be significantly delayed.
- SCAG, CTC or project sponsor can propose a substitute measure.

- Prior to adopting an individual TCM substitution, the measure must have been subject to interagency consultation (i.e., the Transportation Conformity Working Group), public review and comment period and emissions analysis.
- The replacement measure must be subject to the SCAG Regional Council review and adoption.
- Upon adoption by the Regional Council, the new measure will replace the previous measure and will be incorporated into the RTIP through an administrative amendment.
- Adoption by SCAG's Regional Council will rescind the previous TCM and apply the new measure.

*Interagency Consultation.* Interagency consultation occurred at SCAG's publicly noticed Transportation Conformity Working Group meeting on November 28, 2006 and January 30, 2007.

*Equivalent Emissions Reduction.* As demonstrated, the proposed TCM replacement which includes the part time HOV and the projects proposed by RCTC provides emissions less than those of the original TCM.

*Similar Geographic Area.* The replacement projects are located in the same geographic as the full time HOV lane and would serve Riverside County and the surrounding areas.

*Full Funding.* The signage associated with the full time to part time HOV conversion will be funded with $35,000 in Minor State Cash. The RCTC projects will be funded with a combination of STIP funds, CMAQ, FTA, STA, State funds and local SAFE funds.

*Similar Time Frame.* The part time HOV project is anticipated to be operational in mid 2007 and will remain in use for a period of three years. The two FSP expansion projects will be operational by mid-2007, the signal install will occur by the end of 2007 and the Corona parking structure for Metrolink is anticipated to be constructed in early 2008. As permanent projects they will continue to provide air quality benefits beyond the three year time frame of the part time HOV.

*Timely Implementation.* The replacement projects will be monitored through TCM Timely Implementation Reports that SCAG submits to the federal agencies (FHWA).

*Legal Authority.* Caltrans will have full legal authority to implement and operate the part time HOV project. RCTC has full legal authority to implement the additional proposed projects.

*SCAG Review and Adoption.* After Committee approval, the replacement TCM will be presented to SCAG's Regional Council for adoption

**Finding:** SCAG has followed the federally approved process for TCM substitution as described in this document. Substitution of this project does not change funding and timely implementation of any TCM projects not described in this document. With EPA concurrence, all South Coast Air Basin TCM projects in the federally approved conforming 2004 RTP and 2006 RTIP are given funding priority and are on schedule for implementation.

Fiscal Constraint Analysis

**Finding:** All projects listed in the 2004 RTP and 2006 RTIP are financially constrained for all fiscal years.

Interagency Consultation and Public Involvement Analysis

**Finding:** SCAG has consulted with the respective transportation and air quality planning agencies. The proposed substitution of the SR-60 HOV lane replacement was discussed at the Transportation Conformity Working Group (which includes representatives from the respective air quality and transportation planning agencies) on November 28, 2006 and January 30, 2007. In addition, the proposed substitution will undergo the required consultation and public participation process. A 30 day public comment period announcement was posted on SCAG's website in early January.

## EMISSIONS ANALYSIS

The SR-60 HOV lane TCM and the proposed SR-60 HOV part time TCM replacement project are compared by difference in emissions. The emissions factors for vehicle type are based on EMFAC2002. Emissions estimations are for the year 2007. Additional technical information is included in Attachment B.

Table 1 **Project Emissions (tons/day)**

| | | VMT | ROG | CO | NOx | PM10 | PM2.5 |
|---|---|---|---|---|---|---|---|
| Original Project | Full time HOV lane | 367,762 | 261.30 | 2583.83 | 487.32 | 21.11 | 14.51 |
| Replacement Project | Part time HOV lane | 367,761 | 261.31 | 2,584.02 | 487.36 | 21.11 | 14.52 |
| Difference | | | 0.01 | 0.19 | 0.04 | --- | 0.01 |

Notes: VMT x 1000; EMFAC2002; Year 2007; SCAG system-wide modeling statistics.

Table 2 demonstrates the additional emissions reductions that would be achieved by including the five additional Riverside County projects. Emission findings for the RCTC projects were supplied by RCTC's air quality consultant. Due to the small quantity of emissions, emissions information for these projects is expressed in pounds per day rather than tons per day.

Table 2 **Reduction in Emissions (pounds/day)***

| | | VMT | ROG | CO | NOx | PM10 | PM2.5** |
|---|---|---|---|---|---|---|---|
| RCTC projects | Perris Park and Ride | -- | 3.40 | 39.80 | 4.10 | 1.80 | 1.31 |
| | FSP Expansion | -- | 96.00 | 7.00 | 35.00 | N/A | N/A |
| | FSP New Route | -- | 96.00 | 7.00 | 35.00 | N/A | N/A |
| | Corona Parking Structure | -- | 26.00 | 310.10 | 32.40 | 14.40 | 10.48 |
| | Signal Install | -- | 13.00 | 76.00 | 27.00 | N/A | N/A |
| Total (Tons/Day) | | | .0.12 | 0.22 | 0.07 | .01 | .01 |

*Gorski, Ray (January 23, 2007) South Coast Air Quality Management District; Air Quality Calculations, personal communication.
**SCAG Modeling Statistics

As demonstrated in Tables 1 and 2, the proposed part time HOV lane, combined with the projects proposed by RCTC, would provide a reduction in emissions from the full time HOV.

**Finding:** The proposed part time HOV lane, when combined with the proposed RCTC projects, would provide a reduction in emissions from the full time HOV lane.

## PUBLIC REVIEW AND COMMENT

The TCM substitution process as described in the CAA section 176(c) requires public notice and opportunity for comment. A Notice of Availability was posted on the SCAG website (www.scag.ca.gov) on January 11, 2007. A revised report including additional project information was posted on SCAG's website on January 23, 2007. The Notice of Availability was also published in a local Riverside County paper, The Riverside Enterprise Press. Comments received during the comment period will be reflected in the final report submitted to the federal agencies.

# ATTACHMENT A

# CALTRANS REQUEST FOR TCM SUBSTITUTION

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

**DEPARTMENT OF TRANSPORTATION**
ENVIRONMENTAL ENGINEERING
Tony Louka, Office Chief, Environmental Engineering
464 West 4th Street, 8th Floor (M.S. 824)
San Bernardino, CA 92401-1400
PHONE (909) 383-6385
FAX (909) 383-6494
TTY (909) 383-6300

*Flex your power!*
*Be energy efficient!*

December 7, 2006

Mr. Hasan Ikhrata
SCAG
818 West Seventh St., 12th Fl.
Planning & Policy
Los Angeles, CA 90017-3435

**Subject: Caltrans Part-time HOV TCM Substitution on Route 60 in the City of Moreno Valley**

Dear Mr. Ikhrata:

Caltrans is submitting a TCM Project substitution request for the existing full-time HOV lane on Route 60 in the City of Moreno Valley.

The purpose of the project is to get better utilization of the HOV lanes during off-peak periods. The existing configuration of two mixed flow lanes plus one HOV does not operate as efferent as possible. Off-peak Single Occupancy Vehicles (SOVs) are forced to use the capacity in the two available mixed flow lanes, which increases the vehicle density of these lanes. The HOV lane is left underutilized.

As a suitable substitute, we are submitting a part-time HOV to operate from 6:00 AM to 10:00 AM and 3:00 PM to 7:00 PM. Allowing SOVs to use the HOV lane during off-peak hours will reduce the density of the facility, and provide larger headways in the right lane. This will allow for smoother merges at interchanges, which will increase the overall speed of vehicles on this segment. It will also leave the HOV lane available for use during land restrictions such as accidents.

Presently, the part-time HOV is not programmed in the RTIP, however we have placed an amendment to include it in RTIP.

If you have any questions, please call me at (909) 383-6385. Thank you.

Sincerely,

Tony Louka

Tony Louka,
Chief, Office of
Environmental Engineering

cc: Jessica Kirchner (SCAG)
Jonathan Nadler (SCAG)
Sylvia Patsaouras (SCAG)
Mike Perovich (Caltrans)
Ernie Figueroa (Caltrans)
Tom Ainsworth (Caltrans)
Jamal Elsaleh (Caltrans)
Syed Raza (Caltrans)

## ATTACHMENT B

## CALTRANS TCM REPLACEMENT REPORT

Riverside County Transportation Control Measure Replacement

**Presented to**

**Southern California Association of Governments**

**Submitted by**

**Caltrans District 8**
**464 West Street**
**San Bernardino, Ca. 92401-1400**

**November 16, 2006**

## Riverside County Transportation Control Measure Replacement

## I Introduction

Caltrans plans to replace an existing Transportation Control Measure (TCM) with a new TCM project that provides equivalent or greater emissions reductions, while meeting all TCM substitution requirements specified in The Clean Air Act's section 176(c) transportation conformity provisions, including procedures to use in substituting or adding TCMs to approved SIPs.

The replacement will be discussed in this technical report:

> **SR-60 HOV.** On an eight-mile segment of State Route 60 (SR 60) East of Junction for SR 60/ I-215 to Redlands Blvd., convert the existing full-time (24 hrs) High Occupancy Vehicle (HOV) lane to a part-time HOV lane in both directions.

The following report presents the criteria for TCM replacement that apply to the SR-60 HOV lane TCM. Further the report includes a description of the TCM project to be replaced, the need for replacement, the implication of the replacement on the Regional Transportation Improvement Program (RTIP), and a description of the proposed replacement project. The technical analysis for the replacement presents emissions data for the original and replacement TCM.

## II TCM Replacement Procedures and Requirements

Replacement of SR-60 HOV lane with a new TCM must follow the substitution protocol specified in the Clean Air Act's section 176(c).

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, signed into law on August 10, 2005, revised the Clean Air Act's section 176( c) transportation conformity provisions, including procedures to use in substituting or adding TCMs to approved SIPs. The Clean Air Act as amended requires that the replacement TCM have the following:

- 176(c)(8)(A)(i) The substitute measures achieve equivalent or greater emissions reductions than the control measure to be replaced;
- 176(c)(8)(A)(ii) The substitute control measures are implemented in accordance with a schedule that is consistent with the schedule provided for the control measures in the implementation plan;
- 176(c)(8)(A)(iii) the substitute and additional control measures are accompanied with evidence of adequate personnel and funding and authority under State or local law to implement, monitor, and enforce the control measures;
- 176(c)(8)(A)(iv)(I) The substitute and additional control measures were developed through a collaborative process that included participation by representatives of all affected jurisdictions (including local air pollution control agencies, the State air pollution control agency, and State and local transportation agencies);
- 176(c)(8)(A)(iv)(II) The substitute and additional control measures were developed through a collaborative process that included consultation with the Administrator;
- 176(c)(8)(A)(iv)(III) The substitute and additional control measures were developed through a collaborative process that included reasonable public notice and opportunity for comments; and
- 176(c)(8)(A)(v) The metropolitan planning organization, State air pollution control agency, and the Administrator concur with the equivalency of the substitute or additional control measures.

The AQMP specifies procedures for replacing individual projects such as the SR-60 HOV lane:

- The CTCs and/or project sponsors shall notify SCAG when a TCM project cannot be delivered or will be significantly delayed.
- SCAG, CTC or project sponsor can propose a substitute measure.
- Prior to adopting an individual TCM substitution, the measure must have been subject to interagency consultation (via the Transportation Conformity Working Group), public review and comment period and emissions analysis.
- The replacement measure must be subject to the SCAG Regional Council review and adoption.
- Upon adoption by the Regional Council, the new measure will replace the previous measure and will be incorporated into the RTIP through an administrative amendment.
- Adoption by SCAG's Regional Council will rescind the previous TCM and apply the new measures.

Section III of this report includes a summary of the SR-60 HOV lane replacement TCM fit with each of the requirements established by the AQMP.

## III SR-60 HOV Lane TCM Replacement

**SR-60 HOV Lane Description.** The proposed project is a TCM replacement project and is substituting, an already built TCM, the existing full-time HOV lane. The existing project is an approved TCM in the SIP, which opened to traffic in March 2004 as a full-time HOV operation.

**Need for SR-60 HOV Lane Project Replacement.** The 2006 traffic study prepared by Caltrans indicates that the full-time HOV lane is under-utilized during the off-peak hours by 40% to 50%. The purpose of converting the existing full-time HOV lane to part-time HOV lane is to relieve the congestion, increase the travel speed, and improve overall safety by lowering the traffic densities during off-peak hours on the mixed flow lanes.

**Implication of SR-60 HOV Lane Project Replacement for 2006 RTIP.**
The SR60 HOV lane project was included in the 2002 RTIP as follows:

| | |
|---|---|
| RCTC 46360 | In Riverside and Moreno Valley On R60 from RT 215 to Redlands Blvd. Add 2 HOV lanes. |

At the conclusion of the interagency consultation process, Caltrans will request that SCAG amend the 2006 RTIP to designate the part-time HOV project as a TCM.

The replacement project will also subsequently be included in annual TCM Timely Implementation Reports that SCAG submits to FHWA to demonstrate that the projects are being implemented on time in fulfillment of the AQMP TCM requirements.

## Recommended SR-60 HOV Lane Replacement Project

Caltrans proposes to convert the existing full-time HOV lane to a part-time HOV lane in both directions on an eight-mile segment of SR-60, East of junction of SR-60/I-215 (R12.2) to Redlands Boulevard (PM 20.4). The conversion will be for a period of three years at which time it will revert back to a full-time HOV lane. The hours of HOV operation will be from 6 A.M. to 10 A.M. and 3 P.M. to 7 P.M. in both directions of SR-60. The HOV lane will be open to use by single occupant vehicles (SOV) for the remaining hours of the day. A striped buffer between the HOV lane and the mixed-flow lanes will remain unchanged, and no striping modifications are proposed. The SOVs will be able to enter/exit the HOV lanes only at the existing designated ingress and egress locations. New signs will be installed informing motorists about the hours of HOV operation. An aggressive public awareness campaign will be launched to spread the word about the proposed change in operation. Refer to figures 1 and 2 for the project vicinity and location map.

## Technical Analysis

This technical analysis documents the evidence that the SR-60 HOV lane project replacement TCM meets the substitution criteria spelled out in the Clean Air Act's section 176(c): equivalent emissions, similar geographic service area, similar implementation schedule, and demonstrated financial commitment to complete the project on time. The modeling procedure identified below was used for the SR-60 HOV lane replacement modeling.

**Methodology for Analyzing Original Project and Replacement.** The SR-60 HOV lane TCM and the proposed SR-60 part-time TCM Replacement project are compared in terms of difference in emissions. The emission factors for vehicle type is based on EMFAC2002, Version V2.2 and the emissions estimation are for the year 2007.

**Emission Analysis.** Based on the results of the modeling described above, Table 1 compares the existing HOV Operation and the proposed replacement TCM project emission profiles for year 2007. The SCAG's findings after model runs are as follows: "*Results from the base model run (with existing HOV) and the alternative model run (with HOV conversion) were compared and analyzed. Overall the HOV conversion had very little effect on corridor level traffic volumes. There are some diversions of SOVs to the converted HOV lane, but the overall freeway volume showed little change. Also, there are no significant changes in the freeway or HOV speeds between the base and alternative model run. Regional emissions showed insignificant differences between the base and alternative scenarios.*"

**Geographic Area/Service Area/Accessibility.** The replacement project in the City of Moreno Valley serves and provides accessibility in the same corridor as the original TCM.

**Implementation Schedule.** The replacement project will be added to the RTIP through a formal amendment to be approved by SCAG's Regional Council.

**Financial Commitment.** The $35,000 replacement project will be funded with Minor State Cash.

## TABLE 1: 2007 Air Quality Emissions Comparison of Existing HOV and Part-time HOV Replacement TCM on SR-60 in Moreno Valley

**(VMT in 1000s, emissions in tons/day)**

| Existing HOV Operation: | **VMT | ***ROG | CO | NOx | PM10 | SOx | Direct PM2.5 (Annual) |
|---|---|---|---|---|---|---|---|
| LDV+MDV | 342,781 | 228.17 | 2,331.38 | 205.26 | 15.14 | 1.86 | 9.6 |
| HDT | 22,043 | 28.93 | 194.45 | 256.1 | 5.42 | 0.36 | 4.46 |
| Others* | 2,938 | 4.2 | 58 | 25.96 | 0.55 | 0.04 | 0.45 |
| **Sum** | **367,762** | **261.3** | **2,583.83** | **487.32** | **21.11** | **2.26** | **14.51** |
| **Part-time HOV Replacement:** | | | | | | | |
| LDV+MDV | 342,781 | 228.18 | 2,331.59 | 205.27 | 15.14 | 1.86 | 9.61 |
| HDT | 22,042 | 28.93 | 194.47 | 256.14 | 5.42 | 0.36 | 4.46 |
| Others* | 2,938 | 4.2 | 58 | 25.96 | 0.55 | 0.04 | 0.45 |
| **Sum** | **367,761** | **261.31** | **2,584.06** | **487.37** | **21.11** | **2.26** | **14.52** |

Note:
*Others – include Line Haul vehicles, motor homes, school buses, and urban buses.
**VMT X 1000
***Pollutants in tons – South Coast Air Basin. Emissions factors applied in the modeling were based on EMFAC2002, LDV (light duty vehicle); MDV (medium duty vehicle); HDV (heavy duty vehicle).

**FIGURE 1: Project Vicinity Map**

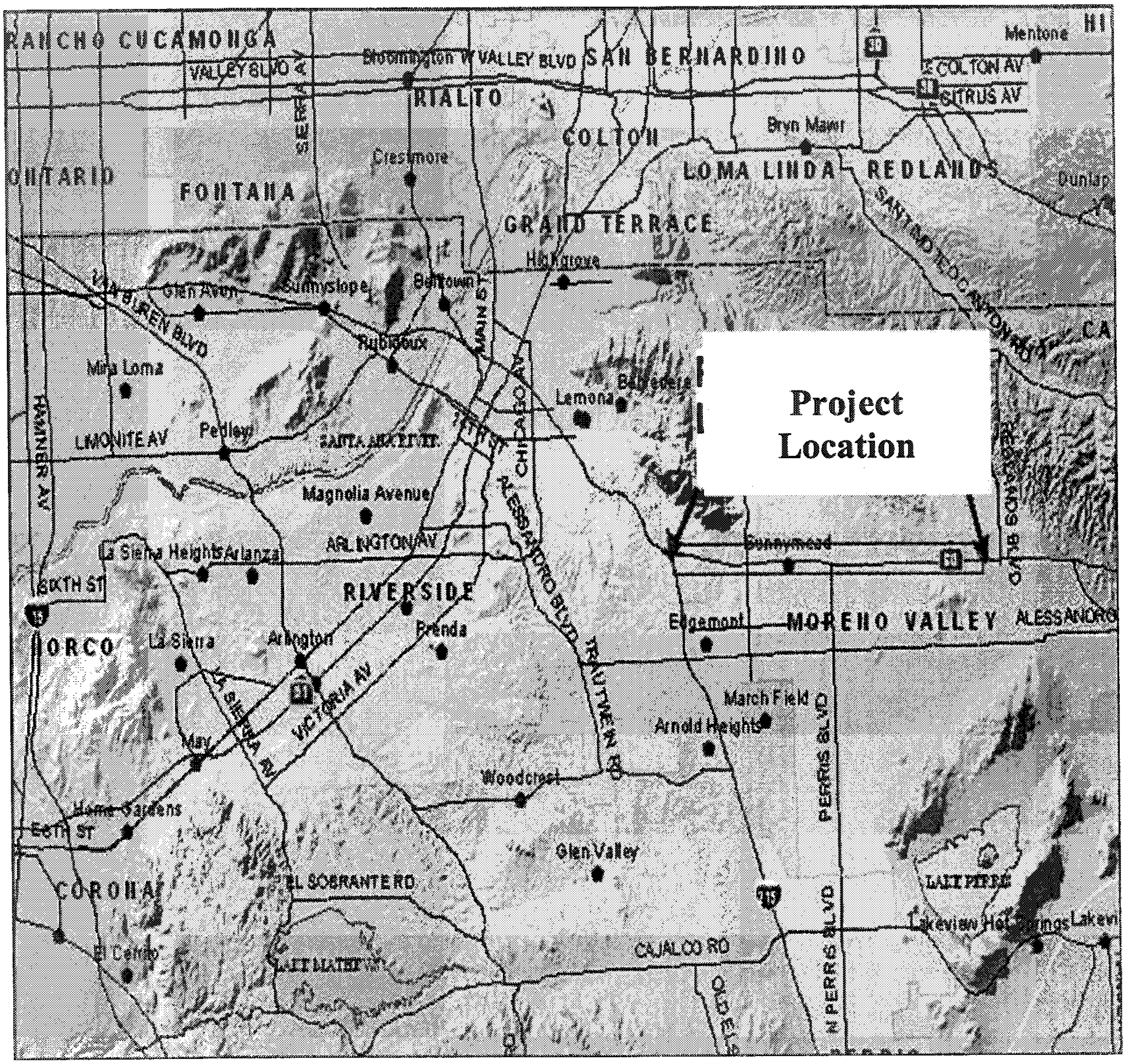
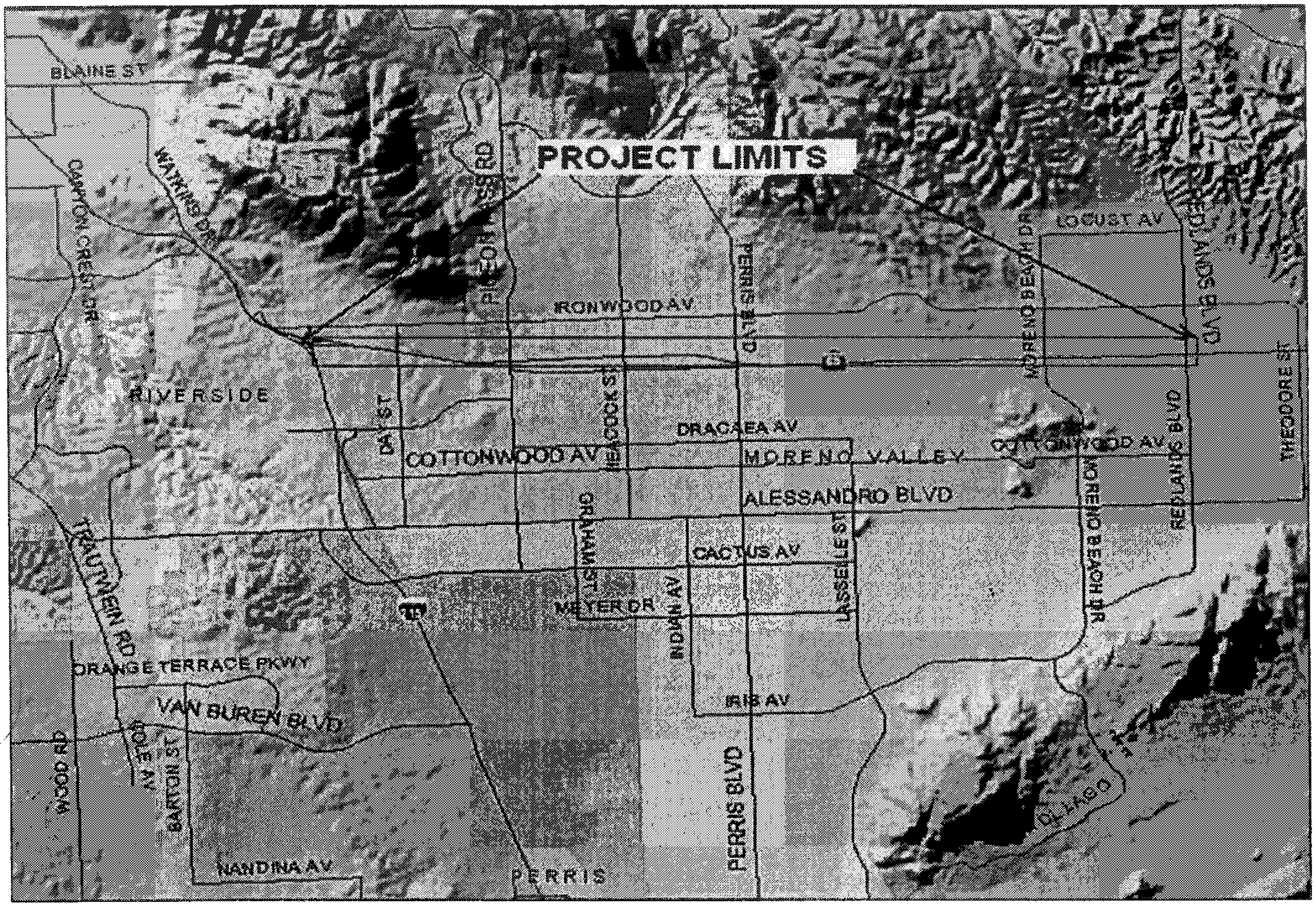


**FIGURE 2: Project Location Map**



## Summary of SR-60 HOV Lane TCM Replacement

The purpose of this TCM replacement is to substitute an existing full-time HOV project on State Route 60 in Moreno Valley with a part-time HOV project. The conversion will be for a period of three years at which time it will revert back to a full-time HOV.

- **SCAG Review and Adoption.** The replacement TCM will be presented to SCAG's Transportation and Communications Committee in the form of a RTIP Amendment supported by emissions modeling and a conformity finding for its recommendation. The meetings will be publicly noticed. A 30-day public comment period and public hearing is included.

- **Interagency Consultation.** Interagency Consultation is occurring at SCAG's publicly noticed Transportation Conformity Working Group meeting on November 28, 2006.

- **Equivalent Emission Reductions.** The part-time HOV project virtually shows no significant difference in emissions from the existing full-time HOV for ROG, NOx, CO AND PM10 as supported with emission model runs.

- **Similar Geographic Area.** The replacement project in the City of Moreno Valley serves and provides accessibility in the same corridor as the original TCM.

- **Full Funding.** The $35,000 replacement project will be funded with Minor State Cash.

- **Time Frame.** The replacement project (the part-time HOV) will be completed and in operation by June 2007.

- **Legal Authority.** Caltrans has full legal authority to construct and operate the replacement project.

- **Implementation Commitment.** The replacement project will be added to the RTIP through a formal amendment to be approved by SCAG's Regional Council.

- **AQMP – Consistency Methodology.** The methodology for analyzing emissions used AQMP – consistent assumptions and modeling techniques.

- **Latest Planning Assumptions.** Technical analysis of the replacement project was based on EMFAC2002 emission factors version V2.2. The emissions estimation is for the year 2007.

# An Assessment of Transportation Control Measure Replacement Projects to Offset State Route 60 High Occupancy Vehicle (HOV) Facility Emissions

***Prepared for:***

***Riverside County Transportation Commission***

***Prepared by:***

***Raymond J. Gorski***

***January 25, 2007***

Raymond J. Gorski ◆ Escondido, CA ◆ (760) 738-8392

Date: January 24, 2007

To: Shirley Medina

From: Ray Gorski

Subject: Air Quality Assessment for SR-60 High Occupancy Vehicle Facility TCM Replacement Projects

Introduction: The Southern California Association of Governments (SCAG) has performed an assessment of the air quality impacts of modifying the HOV lane access requirements on a segment of State Route 60 in Riverside County. The HOV facility would allow mixed flow access on a part-time basis. SCAG's air quality analysis has yielded the following criteria pollutant shortfalls:

*Table 1: SR-60 Part-time HOV Facility Criteria Pollutant Shortfalls*

| **Criteria Pollutant** | **Full-Time HOV** (tons/day) | **Part-Time HOV** (tons/day) | **Emissions Shortfall** | |
|---|---|---|---|---|
| Oxides of Nitrogen ($NO_x$) | 487.32 | 487.36 | 0.04 ton/day | 80 pounds/day |
| Carbon Monoxide (CO) | 2,583.83 | 2,584.02 | 0.19 ton/day | 380 pounds/day |

These shortfall amounts equate to 80 pounds per day of excess $NO_x$ emissions and 380 pounds per day of carbon monoxide emissions. To offset these shortfalls, RCTC has selected additional transportation control measure projects to be implemented within Riverside County.

Projects Proposed to Eliminate Emissions Shortfall: The following projects have been selected by RCTC to mitigate the projected emissions shortfall:

- North Main Corona Commuter Rail Station Parking Structure Construction;
- Perris Park & Ride Facility;
- Freeway Service Patrol Expansion – State Route 60 Main Street to Milliken Avenue;
- Implementation of New Freeway Service Patrol Beats – Interstate 215 Alessandro to State Route 74;
- City of Moreno Valley All-Way Stop Elimination & Implementation of Coordinated Traffic Signal

An air quality assessment was performed to quantify the emission reductions attributable to each project. Each project was assessed using analysis methodologies approved by Caltrans and the California Air Resources Board; these analytic tools are referenced within the discussion of each individual project.

**Project #1: North Main Corona Commuter Rail Station Parking Structure Construction –** The following is an assessment of a new parking structure to be constructed at the North Main Corona commuter rail station. Parking at this station is currently severely impacted; thus, single occupant vehicle (SOV) drivers have little motivation to utilize this commuter rail facility as convenient parking is unavailable. The addition of 830 parking spaces at this rail facility will enable additional SOV drivers to safely park their automobiles and utilize MetroLink in lieu of driving solo.

This assessment was conducted with strict adherence to methodologies approved by Caltrans for the analysis of air quality improvement projects funded under CMAQ[1]. In addition, the most current California Air Resources Board (CARB) emission factors were utilized[2].

Input Factors: The proposed parking structure will result in a net increase of 830 spaces for autos, carpools and vanpools at the North Main Station. The air quality benefits attributable to this new parking facilities result from single occupant drivers utilizing rail for a significant portion of their commute as opposed to solo driving . Thus, to calculate the air quality benefit, one must assess the single occupant automobile trip and VMT emissions displaced as a result of rail use. The input data used in the assessment includes the following:

- Ridership (R) = (Parking Spaces Available)*(Lot Utilization)*(2 commute trips per day). For the purpose of this assessment, R = (830)*(0.75)*(2) = 1,245.
- Per Caltrans, the lot utilization factor should be based upon monitored data. However, in those cases in which the lot is not yet constructed, Caltrans allows the use of a default utilization value, plus an automobile access adjustment factor. For the purpose of this assessment, the lot utilization factor is 0.75.
- Emission Factors: The following emission factors are utilized:

*Table 2: Emission Factors for Automobile Travel*

| | Trip End Factor (grams/trip) | VMT Factor (grams/mile) |
|---|---|---|
| **ROG Factor** | 1.481 | 0.392 |
| **$NO_x$ Factor** | 0.645 | 0.491 |
| **$PM_{10}$ Factor** | 0.014 | 0.218 |
| **CO Factor** | 13.16 | 4.680 |

- Days of Operation: 260 days per year
- Ridership: 623 riders per day
- Average One-Way Commute Distance: 45 miles

[1] "Methods to Find the Cost-Effectiveness of Funding Air Quality Projects for Evaluating Motor Vehicle Registration Fee Projects and Congestion Mitigation and Air Quality Improvement (CMAQ) Projects", May 2005 Edition.

[2] Emission Factor Tables, California Air Resources Board, 2004 Edition.

- Automobile Trip Adjustment Factor: 0.83
- Automobile Access Adjustment Factor: 0.90
- Trip Length for Automobile Access 5 miles

Analysis Results: The following are the estimated daily emission reductions attributable to the North Main Corona commuter rail parking facility, expressed in units of pounds (lbm) reduced per day:

*Table 3: North Main Corona Commuter Rail Station Parking Structure*

| ROG Emission Benefits (lb/day) | CO Emission Benefits (lb/day) | $NO_x$ Emission Benefits (lb/day) | PM Emission Benefits (lb/day) |
|---|---|---|---|
| 26.0 | 310.1 | 32.4 | 14.4 |

**Project #2: Perris Park & Ride Facility** - The following documents the results of an air quality benefits assessment for construction of a new park and ride facility located in the City of Perris. This assessment was conducted with strict adherence to methodologies approved by Caltrans for the analysis of air quality improvement projects funded under CMAQ[3]. In addition, the most current California Air Resources Board (CARB) emission factors were utilized[4].

Input Factors: This park and ride facility will accommodate 141 spaces for carpools and vanpools. The facility will be constructed in the City of Perris, with direct access to the I-215, SR-60, and I-15 commute corridors.

The air quality benefits attributable to park and ride facilities are a direct result of the formation of carpools and vanpools that use the facility as their point of origin. Thus, to calculate the air quality benefit, one must assess the single occupant automobile trip and VMT emissions displaced as a result of ridesharing. The input data used in the assessment includes the following:

- Ridership (R) = (Parking Spaces Available)*(Lot Utilization)*(2 commute trips per day). For the purpose of this assessment, R = 212
- Per Caltrans, the lot utilization factor should be based upon monitored data. However, in those cases in which the lot is not yet constructed, Caltrans allows the use of a default utilization value, plus an automobile access adjustment factor. For the purpose of this assessment, the lot utilization factor is 0.75.
- Emission Factors: The following emission factors are utilized:

[3] "Methods to Find the Cost-Effectiveness of Funding Air Quality Projects for Evaluating Motor Vehicle Registration Fee Projects and Congestion Mitigation and Air Quality Improvement (CMAQ) Projects", May 2005 Edition.

[4] Emission Factor Tables, California Air Resources Board, 2004 Edition.

*Table 4: Emission Factors for Automobile Travel*

| | Trip End Factor (grams/trip) | VMT Factor (grams/mile) |
|---|---|---|
| **ROG Factor** | 1.481 | 0.392 |
| **$NO_x$ Factor** | 0.645 | 0.491 |
| **$PM_{10}$ Factor** | 0.014 | 0.218 |
| **CO Factor** | 13.16 | 4.680 |

- Days of Operation: 260 days per year
- Ridership: 106 riders per day
- Average Carpool/Vanpool: 4 riders
- Average One-Way Commute Distance: 35 miles
- Automobile Trip Adjustment Factor: 0.83
- Automobile Access Adjustment Factor: 0.90
- Trip Length for Automobile Access 5 miles

Analysis Results: The following are the estimated daily emission reductions attributable to the Perris Park & Ride facility, expressed in units of pounds reduced per day:

*Table 5: Perris Park & Ride Facility*

| ROG Emission Benefits (lb/day) | CO Emission Benefits (lb/day) | $NO_x$ Emission Benefits (lb/day) | PM Emission Benefits (lb/day) |
|---|---|---|---|
| 3.4 | 39.8 | 4.1 | 1.8 |

**Project #3: Freeway Service Patrol Expansion** – RCTC, the Service Authority for Freeway Emergencies (SAFE) authority for Riverside County, is expanding the existing State Route 60 beat with two (2) additional service vehicles. The beat operates on the SR-60 between Main Street and Milliken Avenue. The Riverside FSP Program is jointly administered by the California Department of Transportation (Caltrans), the California Highway Patrol (CHP), and the RCTC.

Freeway congestion has become a regular part of the daily commute for thousands of Southern Californians. Congestion not only contributes to motorist stress and inconvenience, but also adversely impacts Southern California's air quality and economic viability. Congestion increases vehicle idling, results in frequent acceleration and deceleration due to stop and go conditions, and significantly increases fuel consumption. These vehicle operating conditions are directly related to higher overall emission rates.

Freeway Service Patrol (FSP) is an incident management measure designed to assist disabled vehicles along congested freeway segments, relieving peak period non-recurrent congestion through the quick detection, verification, and removal of freeway incidents.

There are two fundamental types of freeway congestion: recurrent and non-recurrent. Recurrent congestion occurs when demand exceeds roadway capacity. This typically occurs during peak traffic periods. Non-recurrent freeway congestion is caused by incidents, unforeseeable events such as automobile collisions, vehicle breakdowns, or debris in the roadway. In Southern California, non-recurrent congestion is estimated to account for approximately one-half of all freeway congestion.

There are also two types of FSP deployment; the "Roving FSP, where a fleet of dedicated tow trucks patrol the major freeway corridors. Typically in service during the a.m. and p.m. peak periods, the roving FSP units clear disabled vehicles and accidents by fixing minor problems or by towing a vehicle off of the freeway. A second deployment strategy for FSP is "dispatched FSP". Dispatched FSP units are staged in various locations along a corridor and directed to an incident by a central Traffic Management Center. As discussed below, studies conducted by the University of California, Davis, and University of California, Berkeley, indicate that the roving FSP offers significantly greater effectiveness as a congestion mitigation and air quality strategy as compared to a dispatched FSP. *The RCTC FSP expansion project discussed herein utilizes "roving" FSP tow vehicles.*

<u>Technical Approach for the Quantification of Emissions Reductions</u>: The FSP evaluation methodology used to quantify emission reductions attributable to an FSP beat is based on a computer model developed by the University of California at Berkeley. Named FSP Evaluation (FSPE), the simulation assesses beats with respect to three (3) quantitative Measures of Effectiveness (MOE), including incident delays, fuel consumption, and air pollutant emissions. In addition to model development, the UC Berkeley serves as the principal contractor to Caltrans to perform independent beat analysis for all FSP programs in California.

The three criteria pollutants included quantified in the FSPE are reactive organic gases (ROG), oxides of nitrogen ($NO_x$), and carbon monoxide (CO). FSPE is comprised of two integrated models, FSPE, the evaluation model, and FSPP, the beat "predictor" model. FSPE is primarily used to evaluate the effectiveness of an existing beat; FSPP is used to determine the probability that a proposed beat has merit and should be considered for implementation.

The new beat proposed by RCTC on the SR-60 between Main Street and Milliken Avenue has not yet undergone evaluation by UC Berkeley on behalf of Caltrans. Thus, the quantification of air pollutant reductions is pending. However, UC Berkeley has evaluated and published the results of their independent evaluation of similar FSP beats in the Riverside area. Thus, for the purpose of this assessment, the emission reduction benefits attributable to the newly proposed beat are based on an assessment of comparable existing beats in Riverside County. These comparable beats have undergone assessment by UC Berkeley on behalf of Caltrans.

<u>Emissions Factors</u>: The air quality benefits element of the UC Berkeley FSPE utilizes emission factors as a function of vehicle speed are published by the California Air Resources Board and

Caltrans. These factors are derived using CARB's EMFAC/Burden 7G v1.0 simulation, and are statewide fleet averages. Emission factors for reactive organic gases (ROG) and oxides of Nitrogen ($NO_x$) are included in Table 4 of the ARB publication *Methods to Find the Cost-Effectiveness of Funding Air Quality Projects* cited above. Emission factors by vehicle speed for carbon monoxide (CO) are included in Table 4A. Particulate Matter ($PM_{10}$) emissions are assumed by CARB to be constant across vehicle speeds and equal approximately 0.45 gram per vehicle mile traveled. For purposes of assessing emissions reductions attributable to deployment of FSP; therefore, PM10 emissions will not be considered.

<u>Emission Reductions Attributable to Comparable FSP Beats in Riverside County</u> – The following Tables are published results of evaluations for FSP beats operating in Riverside County. This assessment assumes the emission reductions attributable to the proposed beat will be equal to or greater than the average for all beats in Riverside County. Due to the proposed location of the expanded FSP service, it is anticipated that the actual air quality benefits of the proposed project will exceed the Riverside County average:

*Table 6: Comparable FSP Beat in Riverside County – SR-91*

| | | | | | | |
|---|---|---|---|---|---|---|
| **Input Data** | | | | **FSP Operational Parameters** | | |
| District | | 8 | | Delay Cost ($/veh-hr) | $ 10.00 | |
| Analyst | | J. Rivera | | Fuel Cost ($/gal) | $ 2.00 | |
| Date | | May 4, 2004 | | | | |
| Beat #, Name | | 1 | | Mean Response time w/o FSP (min) | 30.0 | |
| Beat Description | | SR-91 (0.00 -- 5.50) | | | | |
| Beat Length (miles) | | 5.50 | | FSP Response Time (min) | | |
| | | | | AM Peak | 5.5 | |
| | Start | End | # FSP | Midday | | |
| Hours of Operation/ # FSP trucks | Time | Time | Trucks | PM Peak | 5.5 | |
| AM Peak | 5:00 | 8:30 | 2 | | | |
| Midday | | | | FSP Response Time Reduction (min) | | |
| PM Peak | 15:00 | 19:00 | 2 | AM Peak | 24.5 | |
| | | | | Midday | | |
| Number of Service Days/Yr | 252 | | | PM Peak | 24.5 | |
| Cost of FSP Service ($/truck-hr) | $ 60.89 | | | | | |
| Total FSP Assists (Incidents/yr) | 4,974 | | | Traffic Profile | User Defined | |
| **Time Period** | | | | **Daily/Annual** | | |
| **Savings-Performance Measures** | **AM Peak** | **Midday** | **PM Peak** | **Savings-Performance Measures** | **Daily** | **Annual** |
| Delay (veh-hrs) | 179.4 | | 163.8 | Delay (veh-hrs) | 343.25 | 86,499 |
| Fuel Consumption (gal) | 270.7 | | 247.1 | Fuel Consumption (gal) | 517.77 | 130,478 |
| Emissions | | | | Emissions | | |
| ROG (kg/day) | 26.84 | | 24.50 | ROG (kg/day, kg/yr) | 51.34 | 12,938 |
| CO (kg/day) | 1.13 | | 1.03 | CO (kg/day, kg/yr) | 2.15 | 542 |
| NOx (kg/day) | 5.26 | | 4.80 | NOx (kg/day, kg/yr) | 10.06 | 2,536 |
| **Cost Effectiveness** | | | | **Cost Effectiveness** | | |
| Delay Benefits ($/day) | $ 1,794 | | $ 1,638 | Delay Benefits ($/day, $/yr) | $ 3,433 | 864,994 |
| Fuel Benefits ($/day) | $ 541 | | $ 494 | Fuel Benefits ($/day, $/yr) | $ 1,036 | 260,956 |
| Total Benefits ($/day) | $ 2,336 | | $ 2,132 | Total Benefits ($/day, $/yr) | $ 4,468 | $ 1,125,950 |
| Cost of the FSP Service | $ 426 | | $ 487 | Cost of the FSP Service | $ 913 | $ 230,179 |
| **B/C Ratio(s)** | **5.48** | | **4.38** | **B/C Ratio** | **4.89** | |

*Table 7: Comparable FSP Beats in Riverside County – SR-91*

| | | | | | | |
|---|---|---|---|---|---|---|
| **Input Data** | | | | **FSP Operational Parameters** | | |
| District | | 8 | | Delay Cost ($/veh-hr) | $ 10.00 | |
| Analyst | | J. Rivera | | Fuel Cost ($/gal) | $ 2.00 | |
| Date | | May 4, 2004 | | | | |
| Beat #, Name | | 2 | | Mean Response time w/o FSP (min) | 30.0 | |
| Beat Description | | SR-91 (5.50 -- 11.09) | | | | |
| Beat Length (miles) | | 5.59 | | FSP Response Time (min) | | |
| | | | | AM Peak | 5.6 | |
| | Start | End | # FSP | Midday | | |
| Hours of Operation/ # FSP trucks | Time | Time | Trucks | PM Peak | 5.6 | |
| AM Peak | 5:00 | 8:30 | 2 | | | |
| Midday | | | | FSP Response Time Reduction (min) | | |
| PM Peak | 15:00 | 19:00 | 2 | AM Peak | 24.4 | |
| | | | | Midday | | |
| Number of Service Days/Yr | 252 | | | PM Peak | 24.4 | |
| Cost of FSP Service ($/truck-hr) | $ 70.05 | | | | | |
| Total FSP Assists (Incidents/yr) | 3,550 | | | Traffic Profile | User Defined | |
| **Time Period** | | | | **Daily/Annual** | | |
| **Savings-Performance Measures** | **AM Peak** | **Midday** | **PM Peak** | **Savings-Performance Measures** | **Daily** | **Annual** |
| Delay (veh-hrs) | 30.4 | | 190.8 | Delay (veh-hrs) | 221.17 | 55,736 |
| Fuel Consumption (gal) | 45.8 | | 287.8 | Fuel Consumption (gal) | 333.62 | 84,073 |
| Emissions | | | | Emissions | | |
| ROG (kg/day) | 4.54 | | 28.54 | ROG (kg/day, kg/yr) | 33.08 | 8,337 |
| CO (kg/day) | 0.19 | | 1.20 | CO (kg/day, kg/yr) | 1.39 | 350 |
| NOx (kg/day) | 0.89 | | 5.59 | NOx (kg/day, kg/yr) | 6.48 | 1,634 |
| **Cost Effectiveness** | | | | **Cost Effectiveness** | | |
| Delay Benefits ($/day) | $ 304 | | $ 1,908 | Delay Benefits ($/day, $/yr) | $ 2,212 | 557,358 |
| Fuel Benefits ($/day) | $ 92 | | $ 576 | Fuel Benefits ($/day, $/yr) | $ 667 | 168,146 |
| Total Benefits ($/day) | $ 395 | | $ 2,484 | Total Benefits ($/day, $/yr) | $ 2,879 | $ 725,504 |
| Cost of the FSP Service | $ 490 | | $ 560 | Cost of the FSP Service | $ 1,051 | $ 264,781 |
| **B/C Ratio(s)** | **0.81** | | **4.43** | **B/C Ratio** | **2.74** | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Input Data** | | | | **FSP Operational Parameters** | | |
| District | | 8 | | Delay Cost ($/veh-hr) | $ 10.00 | |
| Analyst | | M.Mauch | | Fuel Cost ($/gal) | $ 2.00 | |
| Date | | May 4, 2004 | | | | |
| Beat #, Name | | 4 | | Mean Response time w/o FSP (min) | 30.0 | |
| Beat Description | | SR-91 (11.09 -- 21.64) | | | | |
| Beat Length (miles) | | 10.55 | | FSP Response Time (min) | | |
| | | | | AM Peak | 5.3 | |
| | Start | End | # FSP | Midday | | |
| Hours of Operation/ # FSP trucks | Time | Time | Trucks | PM Peak | 5.3 | |
| AM Peak | 5:30 | 8:30 | 4 | | | |
| Midday | | | | FSP Response Time Reduction (min) | | |
| PM Peak | 15:00 | 19:00 | 4 | AM Peak | 24.7 | |
| | | | | Midday | | |
| Number of Service Days/Yr | 252 | | | PM Peak | 24.7 | |
| Cost of FSP Service ($/truck-hr) | $ 71.64 | | | | | |
| Total FSP Assists (Incidents/yr) | 6,001 | | | Traffic Profile | User Defined | |
| **Time Period** | | | | **Daily/Annual** | | |
| **Savings-Performance Measures** | **AM Peak** | **Midday** | **PM Peak** | **Savings-Performance Measures** | **Daily** | **Annual** |
| Delay (veh-hrs) | 241.3 | | 536.7 | Delay (veh-hrs) | 778.02 | 196,062 |
| Fuel Consumption (gal) | 364.0 | | 809.6 | Fuel Consumption (gal) | 1,173.59 | 295,745 |
| Emissions | | | | Emissions | | |
| ROG (kg/day) | 36.10 | | 80.27 | ROG (kg/day, kg/yr) | 116.37 | 29,326 |
| CO (kg/day) | 1.51 | | 3.37 | CO (kg/day, kg/yr) | 4.88 | 1,230 |
| NOx (kg/day) | 7.07 | | 15.73 | NOx (kg/day, kg/yr) | 22.81 | 5,747 |
| **Cost Effectiveness** | | | | **Cost Effectiveness** | | |
| Delay Benefits ($/day) | $ 2,413 | | $ 5,367 | Delay Benefits ($/day, $/yr) | $ 7,780 | 1,960,620 |
| Fuel Benefits ($/day) | $ 728 | | $ 1,619 | Fuel Benefits ($/day, $/yr) | $ 2,347 | 591,490 |
| Total Benefits ($/day) | $ 3,141 | | $ 6,986 | Total Benefits ($/day, $/yr) | $ 10,127 | $ 2,552,110 |
| Cost of the FSP Service | $ 860 | | $ 1,146 | Cost of the FSP Service | $ 2,006 | $ 505,492 |
| **B/C Ratio(s)** | **3.65** | | **6.09** | **B/C Ratio** | **5.05** | |

*Table 8: Comparable FSP Beats in Riverside County – I-215 & I-15*

| | | | | | | |
|---|---|---|---|---|---|---|
| **Input Data** | | | | **FSP Operational Parameters** | | |
| District | | 8 | | Delay Cost ($/veh-hr) | $ 10.00 | |
| Analyst | | J. Rivera | | Fuel Cost ($/gal) | $ 2.00 | |
| Date | | May 4, 2004 | | | | |
| Beat #, Name | | 18 | | Mean Response time w/o FSP (min) | 30.0 | |
| Beat Description | | I-215 (45.50 -- 36.44) | | | | |
| Beat Length (miles) | | 9.06 | | FSP Response Time (min) | | |
| | | | | AM Peak | 6.0 | |
| | Start | End | # FSP | Midday | | |
| Hours of Operation/ # FSP trucks | Time | Time | Trucks | PM Peak | 6.0 | |
| AM Peak | 5:30 | 8:30 | 3 | | | |
| Midday | | | | FSP Response Time Reduction (min) | | |
| PM Peak | 15:00 | 19:00 | 3 | AM Peak | 24.0 | |
| | | | | Midday | | |
| Number of Service Days/Yr | 252 | | | PM Peak | 24.0 | |
| Cost of FSP Service ($/truck-hr) | $ 67.66 | | | | | |
| Total FSP Assists (Incidents/yr) | 6,641 | | | Traffic Profile | User Defined | |
| **Time Period** | | | | **Daily/Annual** | | |
| **Savings-Performance Measures** | **AM Peak** | **Midday** | **PM Peak** | **Savings-Performance Measures** | **Daily** | **Annual** |
| Delay (veh-hrs) | 374.3 | | 624.3 | Delay (veh-hrs) | 998.64 | 251,657 |
| Fuel Consumption (gal) | 564.6 | | 941.8 | Fuel Consumption (gal) | 1,506.37 | 379,606 |
| Emissions | | | | Emissions | | |
| ROG (kg/day) | 55.99 | | 93.38 | ROG (kg/day, kg/yr) | 149.37 | 37,641 |
| CO (kg/day) | 2.35 | | 3.92 | CO (kg/day, kg/yr) | 6.26 | 1,578 |
| NOx (kg/day) | 10.97 | | 18.30 | NOx (kg/day, kg/yr) | 29.27 | 7,377 |
| **Cost Effectiveness** | | | | **Cost Effectiveness** | | |
| Delay Benefits ($/day) | $ 3,743 | | $ 6,243 | Delay Benefits ($/day, $/yr) | $ 9,986 | 2,516,569 |
| Fuel Benefits ($/day) | $ 1,129 | | $ 1,884 | Fuel Benefits ($/day, $/yr) | $ 3,013 | 759,212 |
| Total Benefits ($/day) | $ 4,872 | | $ 8,127 | Total Benefits ($/day, $/yr) | $ 12,999 | $ 3,275,781 |
| Cost of the FSP Service | $ 609 | | $ 812 | Cost of the FSP Service | $ 1,421 | $ 358,057 |
| **B/C Ratio(s)** | **8.00** | | **10.01** | **B/C Ratio** | **9.15** | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Input Data** | | | | **FSP Operational Parameters** | | |
| District | | 8 | | Delay Cost ($/veh-hr) | $ 10.00 | |
| Analyst | | J. Rivera | | Fuel Cost ($/gal) | $ 2.00 | |
| Date | | May 4, 2004 | | | | |
| Beat #, Name | | 25 | | Mean Response time w/o FSP (min) | 30.0 | |
| Beat Description | | I-15 (40.36 -- 52.27) | | | | |
| Beat Length (miles) | | 11.91 | | FSP Response Time (min) | | |
| | | | | AM Peak | 11.9 | |
| | Start | End | # FSP | Midday | | |
| Hours of Operation/ # FSP trucks | Time | Time | Trucks | PM Peak | 11.9 | |
| AM Peak | 5:30 | 8:30 | 2 | | | |
| Midday | | | | FSP Response Time Reduction (min) | | |
| PM Peak | 15:00 | 19:00 | 2 | AM Peak | 18.1 | |
| | | | | Midday | | |
| Number of Service Days/Yr | 252 | | | PM Peak | 18.1 | |
| Cost of FSP Service ($/truck-hr) | $ 67.66 | | | | | |
| Total FSP Assists (Incidents/yr) | 6,401 | | | Traffic Profile | User Defined | |
| **Time Period** | | | | **Daily/Annual** | | |
| **Savings-Performance Measures** | **AM Peak** | **Midday** | **PM Peak** | **Savings-Performance Measures** | **Daily** | **Annual** |
| Delay (veh-hrs) | 388.6 | | 488.9 | Delay (veh-hrs) | 877.50 | 221,129 |
| Fuel Consumption (gal) | 586.2 | | 737.5 | Fuel Consumption (gal) | 1,323.64 | 333,557 |
| Emissions | | | | Emissions | | |
| ROG (kg/day) | 58.12 | | 73.13 | ROG (kg/day, kg/yr) | 131.25 | 33,075 |
| CO (kg/day) | 2.44 | | 3.07 | CO (kg/day, kg/yr) | 5.50 | 1,387 |
| NOx (kg/day) | 11.39 | | 14.33 | NOx (kg/day, kg/yr) | 25.72 | 6,482 |
| **Cost Effectiveness** | | | | **Cost Effectiveness** | | |
| Delay Benefits ($/day) | $ 3,886 | | $ 4,889 | Delay Benefits ($/day, $/yr) | $ 8,775 | 2,211,293 |
| Fuel Benefits ($/day) | $ 1,172 | | $ 1,475 | Fuel Benefits ($/day, $/yr) | $ 2,647 | 667,114 |
| Total Benefits ($/day) | $ 5,058 | | $ 6,364 | Total Benefits ($/day, $/yr) | $ 11,422 | $ 2,878,407 |
| Cost of the FSP Service | $ 406 | | $ 541 | Cost of the FSP Service | $ 947 | $ 238,704 |
| **B/C Ratio(s)** | **12.46** | | **11.76** | **B/C Ratio** | **12.06** | |

As illustrated in Tables 6-8, above, the emission reductions attributable to FSP beats operating in Riverside County have been quantified and documented by UC Berkeley. The average reduction in criteria pollutants for FSP beats are as follows:

*Table 9: Average Criteria Pollutant Reductions for Riverside FSP Beats*

| ROG Emission Benefits (lb/day) | CO Emission Benefits (lb/day) | $NO_x$ Emission Benefits (lb/day) | PM Emission Benefits (lb/day) |
|---|---|---|---|
| 96.0 | 7.0 | 35.0 | N/A |

**Project #4: New Freeway Service Patrol Service** – RCTC also proposes to implement a new FSP beat on Interstate 215 between Alessandro and SR 74. This new beat will be comprised of two (2) FSP service vehicles. Using the above methodology, it is anticipated that the air pollutant reductions attributable to the proposed new beat will exceed the average FSP beat in Riverside County, as shown in Table 10:

*Table 10: Average Criteria Pollutant Reductions for Riverside FSP Beats*

| ROG Emission Benefits (lb/day) | CO Emission Benefits (lb/day) | $NO_x$ Emission Benefits (lb/day) | PM Emission Benefits (lb/day) |
|---|---|---|---|
| 96.0 | 7.0 | 35.0 | N/A |

<u>Summary</u>: The proposed projects evaluated to date substantially mitigate the increase in emissions projected as a result of modifying HOV lane access on the SR-60. Table 11, below, illustrates the emission reductions attributable to four projects. As previously noted, the fifth project, the elimination of a four-way stop sign and replacement with a coordinated traffic signal in Moreno Valley is pending. It is fully anticipated that the inclusion of the traffic signalization project will more than cover the anticipated SR-60 HOV facility shortfall.

**Project #5: City of Moreno Valley Stop Sign Elimination & Intersection Traffic Signalization** - The City of Moreno Valley has proposed the reconfiguration of the existing intersection of Calle Aurora and Vista Conejo Drive to replace an existing all-way stop with a coordinated traffic signal. From an air quality improvement perspective, the elimination of all-way stop signs removes the requirement that each vehicle decelerate, idle, and then accelerate, resulting in substantial vehicle emission reductions. Also, the elimination of the all-way stops will reduce vehicle queuing, especially during periods of peak traffic volume. This will further reduce vehicle idling emissions and alleviate congestion.

<u>Calculation Methodology</u>: The emissions reduction assessment focuses primarily on the reduction in vehicle deceleration/acceleration profiles as a result of eliminating the all-way stop signs. A secondary emission benefit is the reduction in vehicle idling duration resulting from elimination of extended vehicle queuing during peak volume periods.

The emission factors used in the assessment are based upon empirical data collected by the EPA[5] and are representative of mixed flow traffic. The emission factors are a function of the rate of vehicle deceleration/acceleration. Typical urban deceleration/acceleration profiles were used[6]. Also, vehicle queuing of a level that significantly influences idle emissions will predominately occur during the peak am and pm commutes. Non-peak idle emissions are second order and fall within the overall uncertainty of the analysis results. The methodology utilized to determine future traffic volumes is that included in the 2000 edition of the Highway Capacity Manual[7].

Input Data: The following information was provided in the referenced report:

- Average Daily Traffic (ADT): 9,955 vehicles per day
- Average AM Peak Volume: 2,954 vehicles
- Average PM Peak Volume: 1,028 vehicles
- AM Vehicle Delay (four-way): 104.3 seconds
- AM Vehicle Delay (signalized): 27.4 seconds
- PM Vehicle Delay (four-way): 10.0 seconds
- PM Vehicle Delay (signalized): 8.4 seconds
- Average Deceleration: 4.4 seconds (reference 2)
- Average Acceleration: 5.9 seconds (reference 2)

Emission Factors: Average emission factors for acceleration, deceleration, and idle, expressed in milligrams of emissions per second:

*Table 11: Emission Factors for Vehicle Acceleration/Deceleration Profile*

| | $NO_x$ (mg/sec) | ROG (mg/sec) | CO (mg/sec) |
|---|---|---|---|
| **Deceleration** | 2.84 | 1.18 | 20.04 |
| **Idle** | 3.18 | 2.80 | 77.15 |
| **Acceleration** | 65.5 | 19.7 | 2,013.96 |

The methodology used to assess emission reductions attributable to the elimination of a four-way stop sign and installation of a coordinated traffic signal is to model the impact of not requiring each vehicle at the intersection to decelerate, queue, and accelerate from the stop sign. The deceleration, queue, and acceleration profile is based upon the baseline values included in Reference 2. The average AM peak hour vehicle delay with the four-way stop sign is 104.3 seconds. The average AM peak hour delay for the signalized intersection is 27.4 seconds per

---

[5] "Methodology for developing Model Emission Rates for EPA's Multi-Scale Motor Vehicle and Equipment Emission Systems", EPA420-R-02-027, October 2002.

[6] "Acceleration and Deceleration Models", Rahmi Akcelik and Mark Besley, Akcelik & Associates, 23rd Conference of Australian Institute of Transport Research, Melbourne Australia, December 2001.

[7] Highway Capacity Manual 2000, Transportation Research Board of the National Academies, National Academy of Sciences, 2000.

vehicle. This results in a net average AM peak hour delay of 76.9 seconds. The average PM peak hour vehicle delay with the four-way stop is 10.0 seconds; average PM peak hour vehicle delay with the traffic signal is 8.4 seconds. The net PM peak hour delay is 1.6 seconds.

Emission Reduction Summary: The following Table summarizes the emission reductions attributable to the City of Moreno Valley traffic signal project, expressed in units of pounds per day of criteria pollutant emissions reduced. It should be noted that insufficient data exists to quantify a reduction in exhaust $PM_{10}$ emissions; however, $PM_{10}$ reductions would be an order of magnitude less that the other criteria pollutants and therefore not a significant attribute of the proposed project.

*Table 12: Criteria Pollutant Reductions for Traffic Signalization*

| **Oxides of Nitrogen ($NO_x$)** | **Reactive Organic Gases (ROG)** | **Carbon Monoxide (CO)** | **Particulate Matter ($PM_{10}$)** |
|---|---|---|---|
| 6.38 lb/day | 3.10 Kg/day | 180.00 lb/day | N/A |

N/A = not applicable

*Table 13: Summary of Project Emission Reductions*

| **Project Description** | **ROG Emission Benefits (lb/day)** | **CO Emission Benefits (lb/day)** | **$NO_x$ Emission Benefits (lb/day)** | **PM Emission Benefits (lb/day)** |
|---|---|---|---|---|
| Project 1: North Main Corona Rail Station | 26.0 | 310.1 | 32.4 | 14.4 |
| Project 2: Perris Park & Ride Facility | 3.4 | 39.8 | 4.1 | 1.8 |
| Project 3: FSP Expansion – State Route 60 | 96.0 | 7.0 | 35.0 | N/A |
| Project 4: New FSP Service – I-215 | 96.0 | 7.0 | 35.0 | N/A |
| Project 5: Traffic Signalization - Moreno | 3.10 | 180.0 | 6.4 | N/A |
| **TOTAL** | **224.5** | **543.9** | **112.9** | **16.2** |

If you have any questions regarding the above assessments, please do not hesitate to contact me at rgorski@pacbell.net.